Discussion Paper

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DISCUSSION PAPER

AIR POLLUTION - GENERAL REGULATION

(REGULATION 308)

ONTARIO MINISTRY OF THE ENVIRONMENT

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OVERVIEW

Existing Ontario legislation and regulations designed to provide the necessary controls on emissions to the atmosphere have evolved over the past thirty-five years. During this time, a considerable degree of success has been achieved in limiting adverse effects from air pollution, even though there has been a large increase in the number of emission sources.

Despite the general success of this program in achieving the defined air quality criteria, a number of problem areas have been identified. These include:

- failure to account fully for:
  - long-range transport
  - long-term deposition
  - very short-term effects
  - very long-term effects
  - bioaccumulation and persistence
  - additive and synergistic effects;

- lack of specific requirements for treating emissions prior to their discharge through stacks;

- use of air quality models which are not state-of-the-art and which are applied beyond their original limits;

- confusion in the use of models for fugitive sources (e.g. roof vents) and absence of specific rules for use in multiple source situations;

- lack of opportunity for direct public participation in the standard setting and certificate of approval processes;

- o weaknesses in dealing with land use changes;

- o no special provisions for dealing with experimental situations.

A comprehensive review was undertaken to identify the deficiencies of the existing program and develop new policy options. This review revealed that the existing legislation needs to be re-written to reflect current needs and directions. The principal regulatory mechanism, Regulation 308 - Air Pollution - General, is the focus of the updating process.

The central reform proposed is the reduction of atmospheric contaminant loadings by imposing, for the first time in Ontario, direct emission limits on all air pollution sources of any appreciable size. Emission limits would be determined by the optimum performance various levels of technology could achieve. Selection of the appropriate level of technology would be based on the nature of pollutant effects. Two alternative schemes are offered. In the first option, three levels of control would be used. These would be as follows:

- o the best control technology available (or its equivalent) anywhere in the world for the most hazardous pollutants;

- o the best demonstrated control technology generally available (or its equivalent) for medium hazard pollutants;

- o controls demonstrated as acceptable for low hazard pollutants.

In the second option, limits achievable by the best control technology generally available would be required for both medium and low hazard air pollutants.

The appropriate bottom-of-the-stack controls defined by these schemes would be the minimum control requirements. For sources contributing to predicted exceedances of ambient air standards, further reductions would be required. These reductions would be based on newly developed computer models of atmospheric dispersion. The proposed new models are scientifically more valid than those in the current regulation. The existing point of impingement standards and ambient air guidelines would be replaced with ambient air standards.

The new emission control requirements would be implemented through certificates of approval. These certificates of approval would include ongoing operating requirements.

Changes are also suggested in the standard setting process to deal with odorous compounds, to provide relationships between different averaging times, and to provide for public participation.

Recognizing the difficulties of incorporating a new emission control system and updated modelling into the existing regulatory framework, a number of alternatives are presented for phasing-in the proposals. Other changes, both major and minor, are being proposed. These include:

- control of visible emissions
- emissions of organic material from incinerators
- provisions concerning construction and similar activities
- general emission restrictions
- upsets and shutdowns
- combustion capacity limits.

Ramifications of the proposed changes to other regulations and guidelines and of proposed modifications to definitions are identified. Additionally, the redundancy of certain existing sections is discussed and recommendations made for their withdrawal from the regulatory framework.

CHAPTER 1

INTRODUCTION

The air in Ontario is a precious resource which must be protected by strictly regulating sources of contaminant emissions to the atmosphere.

Ontario's existing pollution reduction program has evolved into a broad, multi-faceted control system which includes:

- air quality criteria based on effects on human health and environmental and property damage;
- standards, guidelines and provisional guidelines designed to ensure air quality criteria are attained;
- a modelling scheme for evaluating concentrations from stack emissions at a point of impingement;
- a requirement for certificates of approval to be obtained for sources of emission to the atmosphere based upon the attainment of the point of impingement standards;
- methods and facilities for measuring ambient air quality and stack emissions;
- a mobile source emission control program;
- a program to examine and evaluate injury and damage to plants and soil contamination from air emissions;
- special regulations designed to control emissions from specific industries;
- intermittent control programs to reduce emissions from particular sources when abnormal atmospheric dispersion

conditions might otherwise cause air quality criteria to be exceeded. These programs include the Air Pollution Index, which operates in major centres in the Province and requires cutbacks by principal emitters when levels of sulphur dioxide and particulate matter are considered potentially harmful. (An air quality index is being developed to provide information to the public on air quality in their communities.);

- abatement procedures including measures to immediately stop activities giving rise to unacceptable emissions, and both stop orders and control orders which specify measures that must be taken over set time periods to reduce emissions;

- guidelines which indicate approved practices for various activities.

A number of areas exist where actual or potential problems have become apparent. Additionally, the science and technology associated with air pollution control has advanced markedly in several areas such as the ability to control and limit stack and fugitive emissions and the measurement and prediction of effects of air emissions.

Therefore, to reduce air pollution in Ontario, the Province's air management program must be reviewed and updated.

In recognition of this need, a complete analysis of the air management program has been undertaken and a number of proposals and alternative courses of action have been developed. The aim of this Green Paper is to foster public discussion on these proposals before they become law.

The existing program is based on four provincial Acts. A number of regulations have been established under these Acts. These regulations contain specific provisions designed to augment or interpret the general measures contained in the Acts. In addition, guidelines relating to specific topics have been developed.

(For a listing of relevant Acts, Regulations and Guidelines, see Appendix (1).)

The initial thrust of the revision process has concentrated on Regulation 308 - Air Pollution - General. This regulation is pivotal in that it details a number of fundamental items including:

- methods for evaluating existing sources and applications for certificates of approval, as required under Section 8 of the Environmental Protection Act;

- measures to control visible emissions;

- authority for preparing the Ontario Air Pollution Index (API) and for using the API to prevent or minimize air pollution episodes by curtailing emissions;

- the requirement for reports on changes in operating conditions of any source that may result in excess emissions;

- limitations on total hydrocarbon emissions from incinerators;

- controls on emissions from construction and similar activities;

- storage, handling and transport requirements for substances with the potential to be released as air contaminants.

The initial phases of the review process included examination of the existing regulation by several internal Ministry Working Groups. At this stage, it became clear that a commitment to bottom-of-the-stack (or pre-stack) controls was required. It was also observed that despite their general success in leading to improvements in air quality, the dispersion models in the existing regulation do not reflect current developments in atmospheric physics and could benefit from a complete overhaul. Following completion of the Working Groups'

review, the Ministry held two workshops to discuss how such changes should be brought about - the first, a general workshop in November 1985 and the second, a specific modelling workshop in June 1986. The proceedings on both workshops, together with related correspondence, are included as Appendices to this report (Appendices G & H).

This discussion paper represents the next significant step in the review process and details ways in which changes might be made. Following the publication of this paper, there will be a 90-day comment period. Public meetings and further consultations with special groups will be arranged during this period to enable Ministry staff to discuss the various options. Written comments on the proposals are encouraged and these will form the basis for further discussion prior to the production of a draft regulation.

The draft regulation will be mailed to interested parties and further comment will be encouraged over a 45-day period prior to developing a final draft regulation.

CHAPTER 2

NEW AIR EMISSION CONTROL STRATEGY

Background

The direct authority for most of the items in Ontario's air pollution abatement program is drawn from Part II, Sections 5 - 14 of the Environmental Protection Act. Among the relevant features of Part II are the following:

- restrictions on contaminant emissions into the environment;
- authority to issue control and stop orders;
- a requirement for proponents to obtain a certificate of approval for sources discharging contaminants into any part of the natural environment other than water;
- authority to issue program approvals;
- notification requirements in the event of excessive emissions;
- prohibition of the emission of contaminants causing or likely to cause significant effects.

The implementation of these provisions is primarily dependent on Section 5 of Regulation 308. This section states:

> "5.-(1) The maximum concentration of a contaminant set out in Column 1 of Schedule 1 [Schedule 1 of the Regulation is a list of contaminants with half-hour point of impingement concentration standards] at a point of impingement from a source of contaminant, other than a motor vehicle, shall not be greater than the concentration set out opposite thereto in Column 3 of Schedule 1, expressed in the unit of concentration set out opposite thereto in Column 2 of Schedule 1.
>
> (2) The concentration of a contaminant at a point of impingement may be calculated in accordance with the Appendix.

(3) No person shall cause or permit the concentration of a contaminant at a point of impingement to exceed the standard prescribed in Schedule 1".

The control strategy developed under these provisions involves a number of elements including:

- the setting of maximum ambient air quality criteria based on effects and derivation of half-hour point of impingement standards from these criteria (this is done on the basis of recommendations by the Environmental Air Standards Setting Committee (EASSC));

- evaluation of the impact of sources (this is achieved by the calculations in the Appendix to the Regulations - to obtain a certificate of approval, a proponent must demonstrate that point of impingement standards will be met);

- controls on existing sources in the form of control orders and special regulations to ensure the attainment of satisfactory local or regional air quality.

This system of controls has resulted in improvements in ambient air quality. It provides:

- a uniform standard to be applied province-wide to each contaminant;

- a uniform method for the evaluation of sources;

- a logical and consistent connection between emission standards and ambient air quality criteria;

- a flexible process so that applicants can select their own method(s) for achieving the standards, thereby ensuring cost-effectiveness.

However, a number of weaknesses in this approach have been observed:

- failure to account for:
  - long-range transport
  - long-term deposition
  - very short-term effects
  - very long-term effects
  - bioaccumulation and persistence
  - additive and synergistic effects;
- lack of a specific requirement for pre-stack emission controls (it is possible to meet standards by using just dispersion);
- atmospheric dispersion models which are not state-of-the-art and are applied beyond their original limits;
- paucity of formulae to yield emission rates necessary for dispersion calculations for many fugitive sources;
- lack of specific direction for use in multiple source situations;
- lack of special provisions for dealing with experimental installations;
- absence of an opportunity for public participation in the standard setting process and certificate of approval process;
- weaknesses in dealing with land use changes unless the source is modified or expanded and a new certificate or certificates of approval issued.

Emission Control Proposals

A Ministry Working Group, convened to review the existing approval mechanism, identified "Best Reasonable Technology" or "Best Practicable Technology" as a basic emission requirement for all sources.

Subsequent analysis of this concept of establishing minimum emission control requirements revealed a need for tighter controls on contaminants with high toxicity or on contaminants having a tendency to persist or bioaccumulate. Emission control strategies developed in the U.S., incorporating varying levels of emission control, were reviewed in detail. Characteristics of these strategies include:

- o very strict controls to deal with designated substances and other special circumstances (LAER or Lowest Achievable Emission Rate);
- o strict controls to deal with new sources in non-compliance situations (BACT or Best Available Control Technology);
- o generally acceptable emission restrictions to apply to other sources (Standards of Performance for New Stationary Sources, more usually referred to as New Source Performance Standards, abbreviated NSPS)

For a more comprehensive discussion of U.S. legislation, see Appendix E.

For convenience in making use of the substantial body of material available from case-by-case determinations in the U.S., the Ministry is proposing to use the terminology of the U.S. framework, but with definitions specific to Ontario.

The proposed Ontario system requires a ranking method to indicate the appropriate control level for specific contaminants. A method has recently been developed for the Ministry as a screening mechanism for the standard setting process operated by the Hazardous Contaminants Co-ordination Branch. It is proposed that this method be modified to provide a means for ranking contaminants based on the toxicity, persistence, bioaccumulative and transport characteristics of air contaminants.

Details of the Priority List Working Group (PLWG) system, as this method is known, are to be found in Appendix A. It uses a scoring system in which chemicals are evaluated in a number of categories, each representing an important health hazard or property. The magnitude of the score assigned within each category reflects the level of concern and helps to discriminate among these levels. This is a common characteristic of scoring systems developed previously by other regulatory agencies. In the toxicity categories, for example, carcinogenicity, mutagenicity, lethal and sub-lethal effects are scored 0, 2, 4, 6, 8 or 10. Persistence and bioaccumulation are scored 0, 4, 7 or 10. Transportability is scored 0, 2, 3 or 4. Combining rules are used to produce specific scores and determine emission control levels.

At this time, the proposed scoring system deals only with individual contaminants on the basis of health effects on human beings and animals, and damage and injury to vegetation. It is anticipated that other factors will be included in the system as required and as experience is obtained in using the method. These will include serious indirect effects on human well being and the environment, such as those associated with the chlorofluorocarbon (CFC) chemical group (CFC's are thought to be destroying the earth's protective ozone layer).

The proposed evaluation system is outlined in Table 1.

Clearly, such a system can be adjusted to reflect several different combinations of applicable control technology. The Ministry has considered using this concept with a two- and three-level control system, with the levels being denoted as LAER, BACT-EA and NSPS respectively.

LAER would be the emission rate achieved by the best emission control system available, or its equivalent. Proponents would be required to undertake a thorough analysis of all approved or existing facilities for such a class, category or source in all other jurisdictions, unless it could be shown that such emission control would not be technically achievable in the case in point. For these determinations the U.S. LAER levels of control would provide useful background.

TABLE 1

ILLUSTRATION OF APPROACH FOR THE CLASSIFICATION OF AIR CONTAMINANTS

INDIVIDUAL PARAMETER LEVELS OF CONCERN AND/OR INTERRELATIONSHIPS OF CONCERN FOR CHEMICALS WITH:	APPLICABLE CONTROL TECHNOLOGY LEVEL (3 LEVELS)	APPLICABLE CONTROL TECHNOLOGY LEVEL (2 LEVELS)
o A VERY HIGH SCORE OR SCORES (10) in any specific TOXICITY PARAMETER Examples: acrylonitrile benzo(a)pyrene hexachlorobenzene o VERY HIGH COMBINATION SCORES (≥20) including o a high TOXICITY score (8) o a high PERSISTENCE (10) BIOACCUMULATION (10) score, and o a TRANSPORT score (0,2,3,4) Examples: lead cadmium	LAER	LAER
o A HIGH SCORE OR SCORES in any individual TOXICITY PARAMETER (8) Examples: tetrachlorobenzene o HIGH COMBINATION SCORES (≥14 <20) including, o a medium high TOXICITY score (4-6) o a high PERSISTENCE (7 or 10) BIOACCUMULATION (7 or 10) score, and o a TRANSPORT score (0,2,3,4) Examples: pentachlorophenol, hexachlorocyclohexane	BACT-EA	BACT-EA
o SCORES not falling into any of the above Examples: hexane, toluene	NSPS	

BACT-EA would be the emission rate achieved by the best control technology generally available, taking into consideration reasonable economic and other factors. The evaluation would require an examination of more or less stringent alternative control measures and the development of incremental financial and other aspects (e.g. energy) of each alternative. For these determinations, the U.S. BACT levels of control would provide useful background.

NSPS would be the emission rate associated with the minimum level of control demonstrated as acceptable at similar sources. Typically, NSPS data from the U.S. could be referenced, together with other North American data. Regional and industrial economic factors would also be included in the evaluation.

The Ministry does not intend to mandate actual technology, for any class - proponents will continue to be able to select their own equipment and manufacturers, provided the appropriate emission rate can be achieved.

In the two-level system, very highly toxic contaminants and moderately toxic contaminants with high combination (persistence, bioaccumulation and transport) scores would trigger a very strict level of emission control. Other contaminants would be required to meet a lesser level of control. Using the system, contaminants such as acrylonitrile, cadmium and lead would be assessed as LAER and would require the highest level of emission controls.

Under the three-level system, the treatment of LAER sources would be the same as that described above. However, there would be a division between emissions which can be safely handled using reasonable control measures and those which require a more sophisticated degree of control. Under such a system contaminants such as tetrachlorobenzene, pentachlorophenol, sulphur dioxide and nitrogen oxides would be considered as BACT-EA pollutants, while emissions such as hexane, toluene and inert particulates, all of which have nuisance effects but are not toxic, persistent, or bioaccumulative, would be rated as NSPS pollutants.

The Ministry is proposing to undertake the classification of all contaminants which currently have listed standards, ambient air quality criteria, tentative standards, guidelines and provisional guidelines. In addition, the Ministry will develop protocols to enable proponents to undertake the evaluation of other contaminants.

A minimum base set of data will be required for the classification process. Preliminary considerations indicate that information will be required on acute toxicity, mutagenicity, carcinogenicity, bioaccumulation and physico-chemical properties. The protocol will stress that it is unacceptable to emit chemicals about which little or nothing is known. If no direct information is available, estimates based on known data for similar compounds and incorporating appropriate safety factors will be permitted.

It is anticipated that in cases where information is not in the public domain, it will be supplied by manufacturers or others who will require protection for their proprietary interests. If the basic level of information is not available, approval generally will not be given. However, the person responsible for the approval function should have the discretion to grant an approval which stipulates use of LAER.

Whether a three-level or two-level system is used, it will be necessary for the Ministry to provide definitions for the emission levels selected. As indicated above, U.S. experience in this area will be utilized. The actual way in which the Ministry should establish these levels is a matter where discussion is invited.

A number of options are being considered for identifying appropriate emission rates:

Option 1: The Ministry would specify the general guidelines, methods and requirements for defining acceptable emission rates, with proponents undertaking the necessary analyses.

Under such a system, an applicant would initially identify the appropriate level of control (LAER, BACT-EA, NSPS) for the facility for review and auditing by the Ministry.

Option 2: The Ministry would develop maximum emission rates for LAER, BACT-EA (and NSPS) contaminants on individual processes, using a priority ranking system.

Under this type of system, because of the broad variety of emission sources to be evaluated, each industrial process or type of process would require a unique maximum emission rate for each significant or critical emission component. The burden such an exercise would place on Ministry resources would be immense. To ensure that the most significant contaminants would be dealt with first, the priority system developed by the PLWG would be used and relevant industrial processes selected.

Option 3: Representative committees would develop comprehensive sector based emission rates. Definition of Control Levels would be provided in specific regulations.

This option is analagous to the MISA (Municipal-Industrial Strategy for Abatement) approach currently being used to examine discharges to watercourses. Its main attraction, other than that it would provide a uniformity of approach to both air and water, is that it would incorporate proposals directly into a regulatory format, thereby establishing definite, easy-to-interpret requirements for each type of emission source. However, there are significant differences between water and air emission sources, particularly with respect to the number of discharge points. For example, a typical major facility might have a single combined waste-water discharge while having over a dozen separate points of air emissions from different unit operations, including fugitive emission sources. In addition, an attempt to establish Canada-wide emission controls on a sectoral

basis undertaken in the late 1970's encountered considerable difficulties in this area and was unable to arrive at consensus positions for any sector.

Option 4: Percentage contaminant removal requirements set by contaminant/contaminant class.

Proposals for the destruction of toxic contaminants frequently use data on the percentage removal or destruction and removal efficiency obtained in similar processes. Such data could be used more extensively to evaluate all proposals, with the Ministry developing guidelines as to what would be considered appropriate in the Ontario context. In some respects this approach is similar to that proposed in Option 2.

Option 5: Specification of Ministry-approved control technologies and/or emission standards, taking into account the contaminant toxicity, type of emitting process, and size of the emitting process.

Under this type of system, the Ministry would identify the appropriate control technologies and emission limits (either emission rates or concentrations in the exhaust gases) required for various processes, based on the nature of the process and the size of the operation. This would first entail literature searches on control measures adopted for each emitting process in other jurisdictions and their effectiveness. As well, there might be some form of dialogue with industry in the province to arrive at emission characterizations for processes, appropriate levels for the divisions between "small" and "large" sources, and the technology applicable to those sizes of the processes.

Generally, in such regulatory systems smaller sources are permitted to use emission reduction measures which are less stringent than those imposed on similar but larger sources.

The requirement would still be that sources must meet the emission limit, but need not necessarily use the same technology which was first noted to achieve that degree of control. The regulations on volatile organic compounds (VOC) in the U.S. are one example of such a system.

As with the other systems considered, some way to take contaminant effects (e.g. toxicity) into account when determining the necessary degree of control would also be used in the approval process.

Ambient Air Requirements

The proposed emission requirements outlined above will establish minimum emission control levels. It is also necessary to maintain ambient air quality. Evidence of the probable attainment of satisfactory air quality will generally be obtained through dispersion modelling.

It is recognized that no single dispersion model is appropriate for use in all situations - peculiar atmospheric conditions and physical considerations require specialized models. It should be noted, in this respect, that the models in the existing Regulation 308 have been recognized by many modelling experts as scientifically inadequate to cover the spectrum of conditions found in Ontario, but their simplicity and reasonable success in terms of maintaining satisfactory air quality has led to their continued use.

In developing a more scientifically valid modelling package, the following criteria were used:

- the models selected had to be applicable to calculations of air quality over various time scales;

- the models had to be scientifically credible and state-of-the-art;

- the evaluation of model calculations against monitoring data had to show good performance in the prediction of down-wind concentrations;

- the models had to be feasible for routine application.

The proposed models, described in detail in Appendix H, reflect variations in the dispersion of pollutants according to planetary boundary layer characteristics (the region of the atmosphere nearest to the ground which is directly influenced by the presence of the surface) and pollutant release heights. Special situations are covered by:

- a shoreline fumigation model;
- physical modelling;
- a building wake model.

Sources would be divided into two types:

Type A: Source complexes which are predicted to have little effect on ambient air concentrations of a contaminant, even under worst-case conditions. Such contributions are proposed as those which are equal to, or less than, 30 percent of the air quality standard.

Type B: Source complexes which produce contaminant emissions resulting in concentrations greater than 30 percent of the air quality standard.

Type B situations would be further divided into two groups:

(1) source complexes located in a region where a relatively uniform background concentration for the contaminant exists, regardless of origin;

(2) source complexes located in a region with a non-uniform background due to other source complexes.

consequently, it is proposed that situations would be evaluated in three differing fashions:

Type A: Where the worst-case modelling indicates that the total contribution from a group of sources is less than 30 percent of the standard, no further modelling would be required unless special circumstances indicate otherwise.

Type B(1): Where the maximum contribution plus the maximum uniform background is less than the standard, no further modelling would be required unless special circumstances indicate otherwise.

Type B(2): Where the contribution exceeds 30 percent of the standard and there are other sources which cause a variable background concentration, more detailed modelling would be required.

In order to use the model package to predict the worst-case pollutant concentration, a proponent would be required to gather data on stack heights, diameters, expected flow rates and exit gas temperatures, together with a measure of surface roughness and receptor details where applicable. The modelling package, the logic upon which it is based, and comparisons with the existing modelling provisions of the regulation are described in full in Appendix H. This package seeks the maximum concentration(s) for each atmospheric stability class considered (convective, stable, or transition) and the source type.

Use of the models for Type B(2) sources would require a complete data set of boundary layer parameters incorporating the full range of conditions likely to be observed. This data set would then be combined with the emissions inventory file for existing major sources to form input information for air quality modelling within the radius of influence of the new source. The specifications of the proposed source would be incorporated into the model, and a maximum total concentration produced. This would then be compared with ambient air quality standards.

For special situations different modelling techniques are being proposed.

- Lakeshore situations The shallow boundary layer which can exist near large bodies of water requires the use of special modelling techniques. A fumigation model developed by Misra (1979) is being proposed. The definition of the circumstances under which the model would be used is found in Appendix H, pp. 163-175.

- Complex terrain Sources located in complex terrain or near significant topographic features require individual treatment. A conservative modification to the basic modelling package is proposed. However, if an accurate determination of the terrain effect is required, it is recommended that physical modelling in either a hydraulic or wind tunnel be performed. The proposed definition of "complex terrain" is found in Appendix H, pp 157-158.

- Building wakes Pollutant dispersion from sources located on or near a building(s) may be influenced by the changes in air flow caused by the building(s). The degree to which dispersion is affected depends on meteorological conditions and the relative proximity of the source to the building(s). Specific recommendations are discussed in Appendix H pp. 149-156.

As indicated in previous sections, the fundamental mechanism for control of air emissions under the proposed framework will be the emission control system used and the emission rate permitted. Under these circumstances, the role of modelling will be to predict, if an emission source is constructed at a particular location, whether air quality standards will probably be met. If modelling indicates that air quality might be impaired by a proposed new source, an applicant will have a number of alternative courses of action including:

- changing the process to reduce emissions;

- adopting measures included in the section on phasing in the Regulation (it should be noted that many of these measures are of a temporary nature);

- improving control technology to the point where the modelling indicates that air quality standards will be met;

- adjustments to other sources of the same (similar) contaminants to provide "room" for the proposed source (this would be similar to allowances permitted in the U.S. under offset provisions);

- abandoning the proposed site for the facility.

As a reinforcing measure for the concept of using modelling as a "second line of defence" for the environment, it is also possible to place a limitation on the maximum stack height which can be used for modelling. Using such a system, a proponent would be allowed to build any height of stack but would not be allowed to use a height greater than such a limit in performing modelling.

Using smaller stack heights in the models, greater concentrations are predicted. Thus, if air quality is a concern due to existing sources in a region, such a rule places greater emphasis on the need for better control technology than that dictated by the contaminants involved, without specifically requiring it. Better technology would have to be used because it would be hard to meet the air quality standards without it.

In the United States, a code known as the Good Engineering Practice (GEP) rules is used in such a fashion; these rules limit the stack height which can be used for modelling to 2.5 times the height of the associated building or structure. The problem with this approach is that exceptionally tall structures may permit the use of stack heights greater than might be desired. Other options for such a limit include a fixed height above the top of the building/structure, or simply an absolute limit on the height which can be used in the models.

Generally, limiting the allowance for stack heights in dispersion calculations would have the effect of limiting actual stack heights as well as encouraging improved technology. Short stacks are, for the most part, preferable to tall stacks on aesthetic grounds and because they restrict the radius of influence of emissions from plants.

Standard Setting Proposals

Air quality criteria standards and guidelines are currently set by the Environmental Air Standards Setting Committee (EASSC). This committee is charged with the responsibility of providing documentation and evaluation of contaminants, leading to recommendations for ambient air quality criteria, standards, guidelines and provisional guidelines. Two subcommittees, the Source Testing Subcommittee and the Ambient Measurements Committee, produce testing procedures for contaminants considered by the Committee.

EASSC currently consists of representatives from the:

- Emission Technology and Regulation Development Section, Air Resources Branch
- Special Studies and Services Branch, Ministry of Labour
- Phytotoxicology Section, Air Resources Branch
- Air Quality and Meteorology Section, Air Resources Branch
- Hazardous Contaminants Coordination Branch
- Limnology and Toxicity Section, Water Resources Branch
- Policy and Planning Branch
- Waste Management Branch
- Environmental Approvals and Land Use Planning Branch.

Requests for new criteria, standards and guidelines are initiated by Ministry personnel, usually in the course of considering applications for certificates of approval. The Committee develops a tentative ambient air quality objective and point-of-impingement standard.

For contaminants of special concern the Hazardous Contaminants Co-ordination Branch undertakes detailed multimedia analyses of total

exposure from all sources. As these investigations proceed, their findings are incorporated into the EASSC program.

In the process of changing the emphasis of the air pollution reduction program, it is necessary to effect changes in the EASSC process. It has also been decided that EASSC should be opened to non-government representation and that the Ministry will undertake a documentation of existing standards and guidelines.

The following areas will therefore be subject to scrutiny and change:

- o designation of existing criteria, guidelines and tentative guidelines as standards;
- o non-government representation on EASSC;
- o treatment of odorous contaminants;
- o relationship of different averaging times;
- o documentation of existing standards and guidelines.

o Designation of Existing Criteria, Guidelines and Tentative Guidelines as Standards

The proposed emission control strategy will require ambient air standards instead of the existing point of impingement standards. Accordingly, it is proposed that following a review by the EASSC, the existing ambient air quality criteria, tentative criteria, guideline criteria and provisional guideline criteria will be designated as ambient air standards. Averaging times appropriate to the effect of each contaminant will be used instead of the previous half-hour averaging times. The list of contaminants is attached as Appendix (2).

o Non-government Representation on EASSC

The Ministry is committed to public involvement in all aspects of the standard-setting process. Currently, the Ministry is proposing to create an advisory committee (Advisory Committee on Environmental Standards - ACES) to consult with the public regarding environmental standards and guidelines. This committee will review technical, scientific and other relevant information, including public comment, and provide recommendations for total environmental standards or guidelines with appropriate rationales. In addition to incorporating public comment through workshops, informal meetings with interested groups, public hearings and meetings, it is anticipated that the committee will include non-government members.

The same or a similar framework could be used for the EASSC's work. However, the heavy demand associated with the Environmental Approvals and Land Use Planning Branch requirements to issue certificates of approval could result in the possible overload of such an extensive system.

An alternative approach, which would involve a lesser degree of public input, would be to add non-government members to the existing committee. This would ensure that the current ability of the system to handle the demands from the certificate of approval process would be maintained while the various proposals for air guidelines would be open to wider scrutiny.

With this type of system, as with the existing system, when ACES recommends environmental standards or guidelines, these will be integrated into the air standards or guidelines.

Comment on the alternative ways in which non-government representation on EASSC might be achieved and other suggestions are actively solicited.

- Relationship of Different Averaging Times

Using the proposed modelling package, ambient air standards will reflect the averaging times appropriate to effects (from 1 hour to 1 year), as established by EASSC.

In the current standard setting process it is normal for EASSC to establish the appropriate criteria and extrapolate/interpolate standards for the half-hour averaging period used for regulatory purposes. The method of extrapolation/interpolation and the rationale employed are outlined in Appendix C.

Normally, using this framework, it will be possible for monitoring devices to measure contaminant levels in the ambient air for the appropriate averaging time. In the case of the mobile monitoring units, and other specialized monitoring set-ups, it may still not be possible to equate the averaging time of the monitoring with the standard averaging time. Under these circumstances extrapolations/interpolations might be required. Therefore, it is proposed that the existing method of extrapolation/interpolation (as per Appendix C) be used, but only in cases where:

  - the standard for the contaminant in question has an exceptionally short or long averaging time;

  - it is not possible to monitor contaminants continuously for an appropriate period of time.

- Treatment of Odorous Substances

The modelling package proposed for inclusion in the revised regulation is valid for averaging times of 1 hour or more. Such averaging times are problematic in the case of odorous substances since odour panel olfactory responses observations, which constitute the rationales for such standards, are based on short-term peak observations. To overcome this problem, it is suggested that for enforcement purposes the 10 minute values based

on odour panel observations should be employed. For modelling purposes, an hourly value which takes account of short-term peak values should be used.

- Documentation of Existing Standards and Guidelines

The documentary information on which standards and guidelines have been based is currently within the public domain. However, with the exception of several recent guidelines and standards where the documentation has already been produced in publishable form, this information is not yet readily available or accessible. At present the Ministry is compiling for publication the rationales for all standards. A "List of Tentative Standards, Guidelines and Provisional Guidelines for Air Contaminants" containing the limiting factors - phytotoxicology, human health, air, etc. - is currently being published with regular updates and is available upon request.

CHAPTER 3

PROPOSALS FOR IMPLEMENTATION

Certificates of Approval

Certificates of approval issued under the Environmental Protection Act currently give permission to "construct, alter, extend or replace" rather than to operate. However, in practice, the Ministry has included operating conditions on these certificates (a practice sanctioned by the Environmental Appeals Board and the Environmental Assessment Board). It is proposed that two-part certificates of approval - one to construct and the other, a renewable permit to operate - be introduced.

Monitoring

To establish compliance with the regulation and its associated standards, various monitoring programs will be developed or enhanced.

An increased commitment to monitoring stack emissions will provide data for the evaluation of control technologies and ensure general compliance with the regulatory framework.

- LAER sources will require the installation of continuous monitoring systems (with recording abilities) which reflect process operating conditions and/or maintenance of the emission controls. Stack testing will be required within six months of the facility start-up and subsequently at intervals of not more than twelve months;

- BACT-EA sources will require installation of continuous monitoring systems with recording abilities which reflect the state of operation and/or maintenance of the emission controls. Stack testing will be required within six months of the facility's

start-up and, subsequently, at the Director's discretion, at intervals of twelve months or more.

- o NSPS sources will require verification of emission rates within six months of start-up by a method acceptable to the Director. Subsequent verification will be at the discretion of the Director.

Stack testing will be undertaken in accordance with the Ontario Ministry of the Environment's Stack Testing Code and may be witnessed and audited by trained Ministry personnel. Formal reports on the methods used and results will be submitted to the Ministry for review.

Ambient monitoring is currently undertaken principally by the Ministry. However, several companies and local industrial associations or groups also operate monitors, mostly in connection with special control programs. It is proposed that such self-monitoring requirements should be increased in the future and included on certificates of approval or control orders.

Phasing in the new proposals

The Ministry acknowledges that the phasing-in of requirements for new certificates of approval will have to be achieved over a number of years.

To ensure an orderly process, it is suggested that rules be established with respect to:

- o applications for certificates of approval for new facilities;
- o the phasing-in of the proposed changes for existing facilities;
- o changes to existing operations;
- o approval of new facilities under construction;
- o control orders and Provincial Officers' (Section 126) reports;
- o supplementary control programs;
- o problem areas;
- o very small sources;

- renewal of certificates of approval.

- Applications for Certificates of Approval for New Emission Sources

  Applications for certificates of approval for new sources of emission to the atmosphere will be based on the revised regulation immediately following promulgation, unless the measures proposed are deemed to be improvements to existing operations.

- The Phasing-in of the Proposed Changes for Existing Facilities

  It is proposed that the Ministry bring all existing sources of LAER and BACT-EA contaminants into compliance with the new Regulation within five years of promulgation. An orderly phasing-in will be required. This system will be based on factors such as toxicity scores, industrial groupings and emission quantities. Public participation in the process is encouraged.

- Changes to Existing Operations

  The Ministry believes that it is preferable to prevent the immediate automatic triggering of a total re-approval under Section 8(1)(a) using the proposed regulation, if a plant is undertaking improvements and if LAER controls are not indicated. Therefore, it is proposed that, where

  - a valid certificate of approval, a program approval or a control order issued prior to the passing of the new regulation is in force,

  - plans indicate the proposed changes will result in a net air quality improvement,

  - no exceedance of existing standards is indicated, and

  - BACT-EA or NSPS levels of control are involved,

it will not be necessary for proponents to obtain immediate, complete, re-approval for their entire operation under the new regulation. It will be incumbent on proponents to demonstrate to the satisfaction of the Ministry that an improvement will result from the changes. It is anticipated that to ensure total compliance with the new regulations, this exemption will be eliminated in accordance with the phase-in provisions.

- Approval of New Facilities Under Construction.

  It is proposed that projects emitting NSPS pollutants, which have received complete approval but have not been constructed prior to the promulgation date, can be constructed and operated under the provisions of the existing Regulation 308. Facilities emitting LAER and BACT-EA pollutants will only be permitted to proceed after a review by the Director which shows that the technology proposed is appropriate to the new regulation for the types of contaminants being emitted.

- Control Orders and Provincial Officers' (Section 126) Reports.

  The Ministry proposes that new control orders should immediately incorporate the changes to the Regulation, including the appropriate modelling and emission control requirements, where

  - a Provincial officer's report issued under the Environmental Protection Act Section 126, indicates that an existing facility is a "source of contaminant" and/or

  - a control order is subsequently issued under Section 113 of the Act, regardless of the type of pollutant emitted.

The intent of this provision to immediately implement any changes to the Regulation is to exclude such operations from the five-year phase-in allowance for LAER and BACT (EA) sources.

- Supplementary Control Programs

Supplementary control systems are currently used in a number of situations in Ontario. They provide a cost-effective method of abatement where short-term exceedances of ambient air quality standards have previously been observed under specific meteorological conditions. They involve changes to processes (including measures such as reducing production rates or using different raw materials) for limited periods, when adverse meteorological conditions, known to cause exceedances, are forecast.

The Ministry is considering an extension of the use of such supplementary control systems under the new regulation. Modified facilities emitting BACT-EA and NSPS contaminants will therefore be able to incorporate such systems, provided that:

- worst-case or full air quality modelling indicates less than 100 hours of exceedance above the standard level per annum before the application of supplementary control;

- the proposal involves a facility for which there is an existing certificate of approval;

- Level III controls are upgraded to Level II or I and/or Level II is upgraded to Level I;

- Problem Areas

In areas where local air quality fails to meet the Province's standards, it is proposed that the current system, whereby abatement action on the source(s) responsible is instituted through the Control Order mechanism, should be continued. Consistent with the proposals for dealing with Section 126 reports and subsequent Control Orders, such Control Orders should be written for the pollutants in question, in accordance with the revised regulation. Where several sources are indicated by

measurements or modelling to be contributing to the exceedance, the burden of control should be allocated among all the contributing sources.

- Very Small (or de minimis) Emission Sources

It may not be practical to require the stringent control of emissions where the exhaust concentration or emission rate of a substance is very low. Guidelines will therefore be developed for determining the maximum acceptable exhaust limits for which control will not be automatically required. Such guidelines will serve three general purposes:

- small sources of a single contaminant will not be required to install economically punitive control systems;
- complex sources, containing only traces of a particular contaminant, will be able to concentrate on the removal of significant contaminants without the need to assess technologies which apply to insignificant components of their emissions;
- circumstances under which emission controls will be required will be more tightly specified.

Three different approaches to defining a de minimis level have been identified, namely:

- an emission cap approach which defines an emission limit per unit time (e.g. kg/yr or g/hr);
- a concentration limitation approach, where a de minimis level is defined on the basis of the concentration of contaminant in the stack being less than the standard or on some reasonable factor times the standard;

- a combination approach using concentration limits and an emission cap.

If modelling indicates that the ambient air quality standards/ guidelines for the compound in question will not be met in the area of the source, the appropriate class of control technology would be required. In addition, should the Director have any other just cause, a source which would otherwise be exempted by this provision may be judged to require closer scrutiny. (For a detailed discussion defining "small sources", see Appendix B.)

- Renewal of Certificates of Approval

Certificates of approval under the existing approvals system are granted without expiry dates. Only if changes are made to emission sources, or changes effected to processes or rates of production causing rates of emission to be varied, is there a requirement for a new certificate of approval to be sought.

It is proposed that under the new system, for all sources the certificates of approval to construct and operate should be subject to automatic formal re-examination after ten years from the date of original approval and at subsequent ten-year intervals. This periodic review provision is designed to result in ever-lessening air pollution by promoting the installation and use of up-to-date, appropriate control technology.

To cope with special circumstances, it is further proposed that Directors should be given the right to request reviews at more frequent intervals. This will permit the Ministry to regulate newly recognized problems in a satisfactory manner.

Managing the Modelling Proposals

The modelling proposals, if adopted in whole or in part, will involve a number of administrative decisions including:

- the format of the modelling in the regulation;
- the rules for applying the models;
- the development and provision of data;
- the comparison of modelled data with standards;
- the development of an emission inventory/source inventory.

- The Format of the Modelling in the Regulation

The current regulation includes the modelling provisions as an Appendix to the Regulation. It has been perceived that, in the past, this has constituted a barrier to revising the Regulation as further scientific developments have occurred. Requests have, therefore, been received to omit the specifics of the modelling from the revised Regulation.

In-house legal advice indicates that it is preferable to describe the models very precisely and include them with the regulation when it is filed. When changes are required to the model package, to reflect scientific developments, the regulation would therefore have to be amended.

It has also been suggested that to overcome the problems of reproducing the modelling with the regulation in hard copy form (a difficult and expensive task in light of their complexity), the modelling could be incorporated in disk format if the necessary cross-references are provided and if the disk format of the models is filed with the Regulation. To ensure that the disk version of the regulation is accurate, a line-by-line audit will be undertaken under contract.

- The Rules for Applying the Models

One of the criteria used in the development of the proposed modelling package was that model calculations should show good performance in the prediction of downwind concentrations. However, it is recognized that even with models which perform excellently in this regard, an error factor will still be present.

Predicted values will therefore over- or under-estimate real values by uncertain amounts. To guard against overly conservative model predictions governing the approval process, it is proposed that for non-acutely toxic contaminant emissions with a one-hour standard, the eighth worst predicted hourly value of the year (99.9 percentile value) should be used. In the case of acutely toxic contaminants, the worst hourly value will still be used to guard against the possibility of short-term exceedances.

- The Development and Provision of Data

The meteorological information required to run the worst-case models is relatively simple: range of wind speed; daytime maximum temperatures; and background measured concentrations.

For complex [Type B(2)] situations, meteorological data for the source region will have to be extracted and reduced into a data set of boundary layer parameters, encompassing the range of possible conditions. In addition, detailed emission data will be required from all sources of the contaminant(s) in question in the vicinity of the proposed emission source. The combination of confidentiality of some data, the requirement for considerable interpretative judgement of the meteorological data (e.g. selecting appropriate data sets, extracting the relevant data, interpolating/extrapolating from existing data), and the duplication of effort which would occur if independent proposals were submitted in the same general area, render this aspect of the work better suited to being undertaken by Ministry personnel, possibly on a fee-for-service basis.

- The Comparison of Modelled Data with Standards

Since the modelling package will require long-term or short-term averages to be computed for comparison with ambient air standards/ guidelines, it is necessary to devise the methodology which will

be used. Basically, two methods are available - running the model for the appropriate period or using statistical methods. The former is preferred; either is satisfactory.

- The Development of an Emission Inventory/Source Inventory

  The Ministry currently maintains an emission inventory for the Province. This inventory is based on information provided in applications for certificates of approval for point sources and surrogate measures for area sources. In the past, emphasis was placed on standard pollutants such as sulphur oxides, carbon monoxide, nitrogen oxides, hydrocarbons and particulates. Currently, toxic pollutants are receiving increased attention.

  A number of problems exist with the present inventory including:

  - limited mechanisms for updating information;

  - inadequacy of the system of data input and retrieval;

  - limited detail in the data included.

Among changes which are recommended are the following:

- improved data collection to, at a minimum, the standard required by U.S. E.P.A. and including:

  - name of company,
  - location of source,
  - type of source,
  - type of control device (if any),
  - control efficiency for each contaminant,
  - estimated emission rates for each contaminant
    (i) maximum hourly/daily emission rates
    (ii) average annual emission rates,
  - method used for deriving emission numbers;

- polling existing industries to update the inventory.

CHAPTER 4

OTHER MEASURES

A number of other measures in the present general regulation are oriented towards the everyday control and monitoring of contaminant emissions. These include:

- Air Pollution Index (Section 4);
- Visible Emissions (Sections 7 and 8);
- Emissions of Organic Matter from Incinerators (Section 12);
- Provisions Concerning Construction and Similar Activities (Section 11);
- Upsets and Shutdowns (Section 9);
- General Restrictions (Section 6);
- Combustion Capacity Limits (Section 7).

Review of these provisions indicates that minor changes are required in some instances to make them more effective.

Air Pollution Index (Section 4)

The Air Pollution Index (API) was developed in 1970, primarily to control emissions of sulphur dioxide and suspended particulate in urban areas when atmospheric conditions prevent good dispersion. These two parameters were correlated with increased death rates and health effects in London and New York in the 1950s and 1960s.

The control strategy associated with the API permits the Minister of the Environment (in consultation with the Minister of Health) to inform sources, and ultimately order cutbacks in emissions, if certain specified levels of two contaminants (sulphur dioxide and coefficient of haze (COH)) are exceeded and atmospheric conditions indicate that the situation is likely to persist beyond six hours.

The use of the API as a control device has been very successful in reducing the frequency of "air pollution episodes", and the co-operation of major sources has been excellent. A number of sources have changed to cleaner fuels to avoid intermittent cutbacks.

A secondary aim of the API is to supply objective information to the general public on levels of air pollution in their communities; API levels are made available to the media with explanations of their significance and the control strategy to which they are related.

The Ministry is about to start using another index, the Air Quality Index (AQI). This index, which will be used exclusively to provide public information, will incorporate the following parameters at each location:

- total reduced sulphur (TRS);
- carbon monoxide (CO);
- nitrogen dioxide (NO_2);
- ozone (O_3);
- sulphur dioxide (SO_2);
- coefficient of haze (COH); and
- the API (SO_2 and COH).

An information program has been prepared to explain the Air Quality Index to the public. It is anticipated that this will minimize the possibility of confusion between it and the API. The AQI, because it is not a regulatory tool, will not require incorporation into a regulation. It is proposed that the Air Pollution Index should be retained in the Regulation because of its regulatory function.

It has been suggested that other contaminants, such as total reduced sulphur, carbon monoxide and nitrogen dioxide should be included in the API. In-house legal advice suggests that this could be done. However, neither ambient levels of carbon monoxide nor total reduced sulphur, which could cause health problems, have been observed in Ontario. Nitrogen dioxide criteria have been exceeded in the Province, but

sources of this contaminant are extremely difficult to control on the intermittent basis required in the API system.

It is therefore recommended that the sections of the existing Air Pollution - General Regulation relating to the API (Section 4 and Sections 1(a) and (b)) should be retained in their present form.

Control of Visible Emissions (Sections 7 and 8)

Visible emissions from a source of air pollution generally reflect discharges of particulate matter into the atmosphere, although they may also result from the presence of coloured gases in the exhaust stream. The fact that they are visible is an indication that relatively high concentrations of contaminant(s) are present in the emitting exhaust stream, a presence which suggests that further control measures are required.

The Ministry has worked for a considerable time trying to develop "The Visible Emission Chart of the Province of Ontario". Certain problems, including accurate reproduction of the chart and administrative difficulties, were encountered. Therefore, the Chart was never formalized. As a result, the Ministry has, in practice, made use of trained observers for the determination of opacity.

In addition, existing provisions do not recognize instrumental techniques for measuring opacity, techniques which are now being used in the Province.

There appears to be a need to formalize the role of trained observers, recognize the usefulness of instrumental techniques and develop appropriate protocols. The use of trained observers for the determination of visible emissions has been adopted as the standard means of enforcing opacity requirements in the United States and elsewhere. The procedure to be used by such observers is detailed in Appendix A of "The Environmental Protection Agency Regulations on Standards of Performance for New Stationary Sources". The certification requirements and procedures, including equipment specifications for the

smoke generator used to produce emissions of known opacity for certification training, are also given.

A similar system, combined with references to instrumental methods, appears to offer considerable benefits for the Province of Ontario. Several issues will, however, require clarification, including:

- o the continuation of the exemptions for combustion sources;
- o the status of Visible Emissions Identification Courses;
- o the need for exemptions on batch and cyclic processes;
- o the use of company-generated transmissometer data.

o The Continuation of the Exemption for Combustion Sources

The existing Regulation allows combustors using solid fuels to emit at an opacity of up to 40 percent for "not more than four minutes in the aggregate in any thirty-minute period".

The current position of the Ministry is that this provision is not consistent with the objective of ensuring acceptable air quality under all circumstances. Modern combustors firing solid fuels can be preheated with natural gas or light oil burners. This precludes the necessity for higher opacities on start-up. Better control of fuel feeding systems can avoid swings in emissions associated with changes in feed rate/steam demand. Soot-blowing emissions can be allowed for by using an average opacity, determined over a period of several minutes. On the basis of these considerations, it is recommended that the exemption be eliminated.

o The Status of Visible Emissions Identification Courses

Ministry training courses, including the Visible Emissions Identification Certification Course are open to non-Ministry staff, and this practice will continue. By changing the wording of section 7(3), it would be possible to permit any trained observer to take enforcement action under the Regulation.

- The need for Exemptions for Batch and Cyclic Processes

  Several industrial operators have made representations to the Ministry requesting that allowances be made for batch and cyclic processes which have difficulty meeting the existing requirements. Suggestions have included the possibility of broadening the special provisions. Some of these concerns arose due to the current wording of the Regulation which, taken literally, indicates that a single instantaneous observation may serve as the basis for determining a violation.

  The current approach addresses the concern through time-averaging the observations. The fact that 25 observations are to be made at 15-second intervals over a six-minute period could be written directly into the new version of the Regulation to clarify this aspect.

  These provisions are expected to permit the desired leeway for many batch and cyclical processes. The Ministry's judgement in deciding if there is a case for prosecution must continue in order to determine whether charges will be laid in all cases, including cyclic or batch operations.

- The Use of Company-owned Transmissometer Data

  Despite the reliability problems encountered in the past with continuous instrumental opacity monitors, the Ministry is now of the opinion that there is a good selection of reliable instruments available. Accordingly, their use is strongly advocated in line with Ministry practice to require continuous monitors wherever feasible for contaminants of concern.

  It is recommended that where continuous opacity monitors are judged to be beneficial, they should be included as a requirement for operation on a certificate of approval and:

- that they should include recording devices;

- that records from such recording devices should be kept available for inspection by the Ministry on demand for some minimum period of time;

- that the complete monitoring system (the detector itself, electrical connections and the recording device) should be operated and maintained in such a fashion as to guarantee the accuracy and precision of the device within limits specified in the approval.

In making these recommendations, it is important to emphasize that violations of such requirements should be treated just as seriously as violations of the opacity requirements.

Emissions of Organic Matter from Incinerators (Section 12)

Organic matter in incinerator exhausts indicates incomplete combustion within the system and low destruction efficiencies. The existing section in the regulation (Section 12) uses a limit of 100 ppm on organic matter (hydrocarbons), on the empirical grounds that this level indicates an acceptable level of destruction. Catalytic incinerators, which frequently permit organic compounds of low molecular weight to remain uncombusted, and thus have the potential to exceed this limit (largely through the presence of unburnt methane), are specifically exempted from these provisions.

The Ministry is currently in the process of revamping the existing design and operating criteria for incinerators of all types. These criteria will provide required temperatures, residence times, monitoring requirements (including requirements for continuous total hydrocarbon or carbon monoxide monitors and opacity monitors) and operating practices for new and modified incinerators seeking approval in the Province.

When additional continuous monitoring data become available, some modification to this section may be required. However, at this time it is recommended that most of the current wording should be retained, with minor changes to enhance clarity.

Provisions Concerning Construction and Similar Activities (Section 11)

The existing provisions of Section 11 of Regulation 308 were intended to deal primarily with nuisance effects from a variety of operations not readily amenable to control through the provisions of the approval process. Typically, the operations covered by this section are highly mobile and therefore at a particular site for a limited time only.

In dealing with such temporary sources, it has been found expedient for Ministry officials to use these provisions to achieve on-the-spot abatement.

It is recommended that these special provisions covering temporary sources of air emission be retained in their present form. The Ministry intends to develop guidelines to establish the necessary steps for implementing emission controls from such operations.

Upsets and Shutdowns (Section 9)

Section 9 specifies responsibilities in the event of a failure to operate in the normal manner, a change in operating conditions, or a shut-down which results in emissions in excess of those permitted. It also authorizes a provincial officer to permit continuance of an operation under whatever conditions he/she considers necessary.

The requirements of this Section are at least partially duplicated by provisions of Part IX, s. 79-112 of the Environmental Protection Act entitled "Spills".

The discretionary power to approve operations which will result in violation of other provisions of the legislation is controversial. Doubts exist that the provision has any legal standing regardless of

any practical merits. An in-house legal opinion suggests that the courts would probably declare such a provision ultra vires (outside the Ministry's power). Notwithstanding this, there would appear to be a need for the Ministry to have discretion to approve or accept operations that will cause exceedances due to breakdown, startups and so on, provided efforts are being made to minimize the impact. This issue is being considered separately by an internal Ministry Committee (Ministry Orders, Certificates, Approvals Committee) concerned with enforcement strategy. Pending the outcome of this committee's work, amendments to this section would appear to be premature.

It is therefore proposed that Section 9 be retained in its present form until such time as other recommendations are made concerning immunity from prosecution.

General Restrictions (Section 6)

Section 6 of Regulation 308 specifies restrictions on emissions in terms of effects: discomfort to persons; loss of enjoyment of normal use of property; interference with the normal conduct of business; and damage to property.

The limitation on emissions contained in Section 6 of Reg. 308 is augmented by Section 13 of the Environmental Protection Act. Its importance in the current framework is therefore somewhat diminished. However, in-house legal advice suggests that Section 6 is a prerequisite to using Section 9 of the Regulation and that such a section could not be replaced using only the powers available today under the Environmental Protection Act.

Despite the apparent redundancy of its main intent, it is recommended that Section 6 should be retained in its present format.

Combustion Capacity Limits (Section 10)

Under Section 10(1) of Regulation 308, the use of fuel burning equipment or incinerators is restricted to the fuel or wastes for which

they were designed. Under Section 10(2), the rate of burning is limited to the original rate for which the equipment or incinerator was designed.

This section was included originally in Regulation 308 to provide the Ministry with controls on the operation of fuel burning equipment and incinerators. It supports the intent of the existing certificate of approval process which only grants certificates to construct.

An in-house legal opinion suggests that subsection 1 of this section is a duplication of powers contained under Section 8 of the Environmental Protection Act. Subsection 2 of the Regulation would appear not to be covered under the Act and it is deemed therefore to be prudent to retain the section for enforcement purposes, until such time as the content of certificates of approval includes operating constraints.

It is therefore proposed that this section should be retained in its present form until revisions are made to the certificate of approval process. At that time, this section will be reviewed.

CHAPTER 5

OTHER ISSUES

There are three areas where consideration has been given to include new provisions in the Regulation, namely:

- woodstoves and fireplace inserts;
- open burning;
- contaminant levels in soil, foliage, grass, moss bags and snow.

Woodstoves and Fireplace Inserts

Smoke from residential wood combustion constitutes a growing area of concern, especially in larger communities in northern Ontario. At this time, all "fuel burning equipment used solely for the purpose of comfort heating in a dwelling used for the housing of not more than three families" is exempt from the requirements to obtain a certificate of approval. (This is the only exemption currently afforded any potential or known source of air pollution under the provisions of Regulation 308.) However, it remains necessary for all sources to meet all other requirements set out in Regulation 308 and in the Environmental Protection Act. Nuisance emissions from residential fireplaces and woodstoves can become the subject of abatement action and possible prosecution by the Ministry.

The Ministry has been conducting research into the emissions from fireplace inserts and is represented on the Canadian Standards Association's (CSA) committee charged with the development of standards for woodstoves. This committee is also considering the development of a standard for fireplace inserts.

Discussions with Regional staff have indicated that operating guidelines should also be developed to ensure the minimization of emissions.

The Ministry intends, therefore, to continue with the current research and standard development activities and to produce operating guidelines. Once CSA standards have been finalized, new residential wood-burning installations in Ontario could be required to use equipment which meet them. Consequently, the Ministry is not currently recommending changes to the General Regulation to deal with this issue.

Open Burning

Open burning of waste materials is a matter of concern in many regions of the province. Previous Regulations (449/67, 133/70, 15/70) specified conditions whereby such burning could be undertaken with the permission and under the direction of a provincial officer. These were not, however, included when the Regulation was amended in 1974.

Open Burning Guidelines were also produced in the period 1971-1974, and contracts issued by provincial ministries frequently contained provisions relating to these guidelines.

Examination of open burning in the Province indicates several situations where actual or potential problems exist:

- o controlled burns associated with forest management;
- o fire training exercises;
- o burning of brush and agricultural waste including materials which may be treated with pesticides and similar chemicals;
- o burning of wood wastes and lumber, including materials which may be treated with chemical preservatives;
- o open burning at landfill sites.

In each of these activities, open burning is undertaken with some justification. For example, current Ministry guidelines for landfill

sites allow open burning of clean brush and similar wastes as part of an overall program to maximize the waste capacity of existing sites. However, the Ministry requires strict control measures on incinerators burning garbage and wood wastes. A need is indicated, therefore, for increased open burning controls. Two options appear to be available:

- development of specific guidelines covering the various categories of open burning sources;

- inclusion of specific measures in a revised regulation requiring that such sources comply with tighter emission standards - such standards could be varied according to the necessity of the source.

The option of developing specific guidelines is preferred by the Ministry at this time and the matter is under review by the Ministry's Working Group on Incinerator Strategy.

It is proposed that the matter of open burning be the subject of specific guidelines and that these should be developed as soon as it is practical.

Contaminant Levels in Soil, Foliage, Grass, Moss Bags and Snow

The "upper limits of normal" guidelines for contaminants in Ontario samples of soil, foliage, grass, moss bags and snow were initially developed to assist staff of the Phytotoxicology Section of the Air Resources Branch and other Ministry personnel to interpret the results of complaint and assessment survey investigations. The guidelines represent the expected maximum concentrations of contaminants in surface soil (non-agricultural), foliage (trees and shrub), grass, moss bags and snow from areas in Ontario not subject to the influence of major point sources of emissions. "Urban" guidelines are based upon samples collected from centres of minimum 10,000 population. "Rural" guidelines are based upon samples collected from non-built-up areas. Sample collection involves standard sampling techniques and is

undertaken by Ministry staff. Chemical analyses are performed by the Ministry's Laboratory Services Branch.

The guidelines were calculated by taking the mean of at least 50 samples and adding three standard deviations of the mean. Assuming values are normally distributed, 99 percent of all contaminant levels in samples from "background" locations (i.e. not affected by point sources nor agricultural activities) will lie below these upper limits of normal. They are subject to revision as more analytical data become available. Therefore, concentrations which exceed the guidelines are indicative of pollution, whether it be from an identifiable source, natural causes or unknown cause. Concentrations which exceed the guidelines are not necessarily toxic to plants, animals or human beings. A brief review of world literature has shown that the guideline concentrations are within the ranges of results reported by other investigators.

The purpose of the guidelines is to assist staff of the Ministry in interpreting results of complaint and assessment survey investigations. Where the urban concentrations are exceeded, the Ministry investigates further to determine if the levels encountered are significant and warrant corrective action. Decisions for corrective action are made on a case-by-case basis and involve specific considerations such as nature of the source, land use, soil type, vegetation type, concentration in control samples, and potential toxicity to plants, animals or human beings. The opinion of medical authorities is obtained where human health may be a concern.

It is recommended that the guidelines not be incorporated in the regulation but be published as a reference document after approval by the Environmental Air Standard Setting Committee. (The current version is included as Appendix F.)

CHAPTER 6

ADDITIONAL CONSIDERATIONS

The proposals discussed in previous chapters will necessitate or suggest a number of other changes in the Regulation. These changes are of four types, namely:

- elimination of redundant sections;
- changes to definitions;
- changes to, and possible elimination of, other regulations;
- the adoption of new policies and guidelines.

o Elimination of Redundant Sections

An in-house legal opinion suggested that, given the augmentation in 1983 of Section 13 of the Environmental Protection Act, any contravention of Section 13 of Regulation 308, which states that:

> "No person shall store, handle or transport any solid, liquid or gaseous material or substance in such manner that an air contaminant is released to the atmosphere."

would also be a contravention of Section 13 of the Act.

Accordingly it is proposed that Section 13 of the existing Air Pollution - General Regulation should be repealed.

o Changes to Definitions

It is proposed that the following definitions in Section 1 of Regulation 308 should also be eliminated, since they are defined elsewhere:

- "fuel burning equipment" includes equipment designed to burn fuel but does not include an internal combustion engine;

- "highway" means highway as defined in subsection 1(1) of the Highway Traffic Act;

- "incinerator" includes equipment used for the burning of waste;

- "opacity" means:

  (i) the color of a visible emission in shades of grey to black, or [part (ii) of the definition will be retained].

It is recommended that the following subsection, Section 3.1 should be retained but the units of measurement referred to should be converted into appropriate SI units:

> Fuel burning equipment used for the purpose of comfort heating in a building using natural gas or No. 2 oil at a rate of less than 1.5 million British Thermal Units per hour. (Change to 1.5 million kilojoules per hour.)

o Changes to, and Possible Elimination of, other Regulations

Based on the proposal to include emission limitations which take account of pollutant characteristics in a new Air Pollution-General regulation, it is recommended that the status of the following regulations should be reviewed:

- Regulation 296 - Ambient Air Quality Criteria;
- Regulation 295 - Air Contaminants from Ferrous Foundries;
- Regulation 297 - Asphalt Paving Plants.

o Regulation 296 Ambient Air Quality Criteria

Regulation 296 lists ambient air quality criteria. Under the proposed system the criteria values - that is, the effect levels, and the averaging times over which those effects have been observed - will constitute the standard. The utility of

maintaining two lists, one entitled "Ambient Air Criteria", and the other "Standards, Tentative Standards, Guidelines, and Provisional Guidelines", is questionable. Therefore, it is currently proposed to delete Regulation 296.

- Regulation 295 - Ferrous Foundries and Regulation 297 - Asphalt Paving Plants

  These two regulations contain several regulatory requirements for industries where it was judged inappropriate to use the general measures specified in Regulation 308. When a revised Air Pollution - General Regulation is finally approved, the separate status provided under these regulations for these types of operations will be subjected to comprehensive reviews.

- The Adoption of New Policies and Guidelines

During the past 20 years a number of guidelines have been produced relating to air management and designed principally to assist in the granting of certificates of approval. (An abbreviated list is to be found in "Air Pollution General Regulation Workshop", November, 1985 p.IV-5). In addition to these, there are two Ministry of the Environment Policies relating to air management. It is proposed that a review of all these documents be undertaken after the incorporation of the proposed changes to the Air Pollution - General Regulation.

CHAPTER 7

CONCLUSIONS

It is anticipated that the suggested changes to Regulation 308 outlined in this paper will result in direct improvements in air quality in Ontario, even allowing for any further increases in the number and magnitude of stationary sources in the Province.

In terms of the identified list of weaknesses in the existing approach, it is anticipated that the proposed measures will result in the following:

- substantial decreases in emissions which give rise to
  - long-range transport
  - long-term deposition
  - very short-term effects
  - very long-term effects
  - bioaccumulation;
- commitment to the mandated use of pre-stack emission controls and substantially reduced use of dilution as an appropriate solution to air quality problems;
- replacement of the existing models by state-of-the-art models used within their scientific bounds;
- modelling designed to deal with multiple source situations;
- direct public participation in the air standard setting process;
- measures designed to better address land use changes.

The following items will not be directly dealt with by the proposed new system:

- o the generation of emission rates, particularly for fugitive sources

  - efforts by the Ministry and others are continuing outside the regulatory framework in this regard;

- o experimental installations

  - it is proposed that the Ministry continue to deal with these on a case-by-case basis.

APPENDIX (1)

Acts, Regulations and Guidelines Governing the Air Management Program

Acts

1. Environmental Protection Act R.S.O., 1980 Chapter 141 as amended by 1981, Chapter 49 and 1983, Chapter 52

2. Environmental Assessment Act R.S.O., 1980 Chapter 140

3. Pesticides Act R.S.O., 1980 Chapter 376 as amended by 1981, Chapter 51 and 1986, Chapter 68, Sections 43 to 50.

4. Provincial Offences Act R.S.O., 1980 Chapter 400 as amended by 1983, Chapter 80, Section 1 and Chapter 87; 1984, Chapter 11, Section 206; 1986, Chapter 42

5. Emergency Plans Act 1983, Chapter 30

Regulations

1. Regulation 295 Air Contaminants from Ferrous Foundries

2. Regulation 296 Ambient Air Quality Criteria

3. Regulation 297 Asphalt Paving Plants

4. Regulation 298 Classes of Contaminant Exceptions (Road Salt)

5. Regulation 308 General Air Pollution

6. Regulation 311 Motor Vehicles

7. Regulation 312 Sulphur Content of Fuels

8. O.Reg. 151/81 Lambton Industry Meteorological Alert

9. O.Reg. 660/85 Inco Sudbury Smelter Complex - 1994

10. O.Reg. 661/85 Falconbridge Smelter Complex - 1994

11. O.Reg. 281/87 Ontario Hydro

12. O.Reg. 663/85 Algoma Sinter Operations - 1986/94

13. O.Reg. 16/86 Boilers

14. O.Reg. 14/86 Mobile PCB Destruction Facilities

15. Regulation 751 Pesticides

Policies and Guidelines

1. Policies and guidelines related to emissions from specific types of operations

- 1970 Guidelines for the Construction of Pit Incinerators
- 1970 Guidelines for Conical Wood Waste Incinerators
- 1970 Guidelines for Control of Cupolas
- 1971 Open Burning Guidelines
- 1972 Petroleum Bulk Plants
- 1974 Criteria for Incinerator Design and Operation (under revision)
- 1974 Interim Guidelines for Control of Air, Water and Land Emissions from Asbestos Mining and Milling Operations plus Background
- 1975 Guidelines for Cooling Tower Water Vapour Plumes
- 1976 Vehicle Exhaust Emission Levels
- 1976 Guidelines and Background for the Control of Industrial Waste Emissions to the Air, Water and Land from Country Grain and Feed Elevators
- 1977 Guidelines and Background for the Control of Industrial Waste Emission to the Air, Water and Land from Terminal Grain Elevators
- 1979 Cement Industry Guidelines
- 1982 Environmental Considerations in the Design and Operation of Industrial Wood Burning Operations

2. Policies and guidelines related to siting and zoning requirements

- 1971 Proposed Guidelines for Thermal Generating Stations
- 1973 Guidelines for Land Use Surrounding Small and Medium Sized Sewage Treatment Plants
- 1977 Agricultural Code of Practice and the Certificate of Compliance Procedural Notes (1970, 1973, 1976)
- 1979 Buffers - Use and Design Guidelines
- 1982 Guidelines for the Establishment, Operation, Management, Maintenance and Closure of Landfilling Sites in Ontario
- 1986 Guidance Manual for Evaluating Applications for Approval and Mobile PCB Destruction Facilities
- 1986 Details Document for Mobile PCB Destruction Facilities

3. Policies and Guidelines related to measurement and measurement techniques

- 1975 Calibration Policy of Company-owned Air Quality Instruments
- 1976 Ambient Air Monitoring Site Selection Criteria
- 1978 Sampling Procedure for Airborne Polychlorinated Biphenyls
- 1979 Guidelines for PCB Concentration in Ambient Air
- 1979 Guidelines for the Selection, Installation and Performance of Continuous Opacity Monitors on Stacks in Secondary Lead Smelters

- 1980 Source Testing Code
- 1981 Value of Snow Sampling as an Indicator of the Presence and Distribution of Designated Contaminants (Under review)
- 1982 Phytotoxicology Excess Levels (Under review)
- 1983 Field Investigation Manual

4. Policies and guidelines related to procedures

- 1974 Guidelines in the Assessment of Dry Wall Paint Spray Booths
- 1978 Guidelines for Response to Environmental and Environmental Health Emergencies
- 1982 Draft - Emergency Response Procedures - ARB
- 1982 The Management of PCB Waste and a Code of Practice
- 1982 Assessment of Applications for Approval of Vapourizing Type Burners Fired with Used Crank Case Oil
- 1983 Vegetation Complaint Procedures

APPENDIX (2)

LIST OF PROPOSED AMBIENT AIR STANDARDS

***Indicates under review.**

Name of Contaminant	**Unit of Concentration**	**Ambient Air Standard**	**Averaging Time**
Acetic Acid*	Micrograms of acetic acid per cubic metre of air	2,050	1 hour
Acetone*	Micrograms of acetone per cubic metre of air	39,500	1 hour
Acetylene*	Micrograms of acetylene per cubic metre of air	46,000	1 hour
Acrylamide	Micrograms of acrylamide per cubic metre of air	15	24 hours
Acrylonitrile	Micrograms of acrylonitrile per cubic metre of air	100	24 hours
N-Alkyltoluene Sulphonamide	Micrograms of n-alkyl-toluene sulphonamide per cubic metre of air	35	24 hours
Alpha Naphthol	Micrograms of alpha naphthol per cubic metre of air	35	24 hours
Aluminum Oxide	Micrograms of aluminum oxide per cubic metre of air	35	24 hours
Ammonia*	Micrograms of ammonia per cubic metre of air	3,000	1 hour
Ammonium Chloride	Micrograms of ammonium chloride per cubic metre of air	35	24 hours
Antimony	Total micrograms of antimony in free and combined form per cubic metre of air	2.5	24 hours
Arsenic	Total micrograms of arsenic in free and combined form per cubic metre of air	0.3	24 hours
Arsine	Micrograms of arsine per cubic metre of air	5	24 hours

Asbestos (fibers of length greater than 5 micrometers)	Number of fibres per cubic centimetre of air	0.04	24 hours
Asbestos* (Total)	Micrograms of total asbestos per cubic metre of air	1.6	24 hours
Barium - total water soluble	Total micrograms of water soluble barium compounds per cubic metre of air	10	24 hours
Benzene*	Micrograms of benzene per cubic metre of air	3,300	24 hours
Benzo(a)pyrene (single source)	Nanograms of benzo(a)pyrene per cubic metre of air	1.1 0.22	24 hours 1 year
Benzo(a)pyrene (all sources)	Nanograms of benzo(a)pyrene per cubic metre of air	0.3	1 year
Benzothiazole	Micrograms of benzothiazole per cubic metre of air	70	24 hours
Benzoyl Chloride	Micrograms of benzoyl chloride per cubic metre of air	125	24 hours
Beryllium	Total micrograms of beryllium in free and combined form per cubic metre of air	0.01	24 hours
Biphenyl*	Micrograms of biphenyl per cubic metre of air	60	1 hour
Boron	Total micrograms of boron in free and combined form per cubic metre of air	35	24 hours
Boron Tribromide	Micrograms of boron tribromide per cubic metre of air	35	24 hours
Boron Trichloride	Micrograms of boron trichloride per cubic metre of air	35	24 hours
Boron Trifluoride	Micrograms of boron trifluoride per cubic metre of air	2	24 hours
Bromacil	Micrograms of bromacil per cubic metre of air	10	24 hours

Bromine	Micrograms of bromine per cubic metre of air	20	24 hours
N-Butanol	Micrograms of n-butanol per cubic metre of air	1,875	1 hour
2-Butanone (Methyl Ethyl* Ketone)	Micrograms of 2-butanone per cubic metre of air	31,000	1 hour
N-Butyl Acetate	Micrograms of n-butyl acetate per cubic metre of air	600	1 hour
Butyl Acrylate	Micrograms of butyl acrylate per cubic metre of air	35	24 hours
Butyl Stearate	Micrograms of butyl stearate per cubic metre of air	35	24 hours
Cadmium	Total micrograms of cadmium in free and combined form per cubic metre of air	2	24 hours
Calcium Carbide	Micrograms of calcium carbide per cubic metre of air	10	24 hours
Calcium Cyanide (as total salt)	Micrograms of calcium cyanide (as total salt) per cubic metre of air	35	24 hours
Calcium Hydroxide	Micrograms of calcium hydroxide per cubic metre of air	13.5	24 hours
Calcium Oxide	Micrograms of calcium oxide per cubic metre of air	10	24 hours
Captan	Micrograms of captan per cubic metre of air	25	24 hours
Carbon Black*	Micrograms of carbon black per cubic metre of air	10	24 hours
Carbon Disulphide*	Micrograms of carbon disulphide per cubic metre of air	330	24 hours
Carbon Monoxide	Micrograms of carbon monoxide per cubic metre of air	36,200 15,700*	1 hour 8 hours

Carbon Tetrachloride	Micrograms of carbon tetrachloride per cubic metre of air	600	24 hours
Chloramben	Micrograms of chloramben per cubic metre of air	35	24 hours
Chlordane	Micrograms of chlordane per cubic metre of air	5	24 hours
Chlorinated Dibenzo Dioxins (CDDs)	Picograms of chlorinated dibenzo dioxins per cubic metre of air	30	1 year
Mixtures of Chlorinated Dibenzo Dioxins and Chlorinated Dibenzo Furans (CDFs)	Picograms of a mixture of chlorinated dibenzo dioxins and chlorinated dibenzo furans per cubic metre of air $x/30 + y/30(50) = 1$ x = concentration (pg/m3) of CDDs in air y = concentration (pg/m3) of CDFs in air		1 year
Chlorine	Micrograms of chlorine per cubic metre of air	150	24 hours
Chlorine Dioxide	Micrograms of chlorine dioxide per cubic metre of air	30	24 hours
Chlorodifluoro-methane	Microgrms of chlorodifluoro-methane per cubic metre of air	300,000	24 hours
Chloroform	Micrograms of chloroform per cubic metre of air	500	24 hours
Chromium	Total micrograms of chromium in free and combined form per cubic metre of air	1.5	24 hours
Coal Tar Pitch Volatiles (soluble fraction)	Micrograms of coal tar pitch volatiles per cubic metre of air	1	24 hours
Copper	Total micrograms of copper in free and combined form per cubic metre of air	50	24 hours
Cresols	Micrograms of cresols per cubic metre of air	75	24 hours

Cyclo Sol 63	Micrograms of cyclo sol 63 per cubic metre of air	5,000	24 hours
Cyclohexane	Micrograms of cyclohexane per cubic metre of air	100,000	24 hours
Chromium (Di, Tri, and Hexavalent forms)	Micrograms of chromium per cubic metre of air	1.5	24 hours
Dalapon Sodium Salt	Micrograms of dalapon sodium salt per cubic metre of air	50	24 hours
Decaborane	Micrograms of decaborane per cubic metre of air	25	24 hours
1-Decene	Micrograms of 1-decene per cubic metre of air	60,000	24 hours
Diacetone * Alcohol	Micrograms of diacetone alcohol per cubic metre of air	815	1 hour
Diazinon	Micrograms of diazinon per cubic metre of air	3	24 hours
Diborane	Micrograms of diborane per cubic metre of air	10	24 hours
Dibutyltin Dilaurate	Micrograms of dibutyltin dilaurate per cubic metre of air	30	24 hours
Dicapryl Phthalate	Micrograms of dicapryl phthalate per cubic metre of air	500	24 hours
1,1-Dichloro-ethene (Vinylidene Chloride)	Micrograms of 1,1-dichloro-ethene per cubic metre of air	35	24 hours
Difluoro-dichloromethane (Freon 12)	Micrograms of difluoro-dichloromethane per cubic metre of air	500,000	24 hours
Diisobutyl Ketone	Micrograms of diisobutyl ketone per cubic metre of air	400	1 hour
N,N-Dimethyl-1,3-Diaminopropane	Micrograms of n,n-dimethyl-1,3-diaminopropane per cubic metre of air	20	24 hours

Dimethyl * Disulphide	Micrograms of dimethyl disulphide per cubic metre of air	40	1 hour
Dimethyl * Ether	Micrograms of dimethyl ether per cubic metre of air	2,100	24 hours
Dioctyl Phthalate	Micrograms of dioctyl phthalate per cubic metre of air	500	24 hours
Dioxane*	Micrograms of dioxane per cubic metre of air	3,500	24 hours
Dioxolane	Micrograms of dioxolane per cubic metre of air	10	24 hours
Dodecyl Benzene Sulphonic Acid	Micrograms of dodecyl benzene sulphonic acid per cubic metre of air	35	24 hours
Dodine	Micrograms of dodine per cubic metre of air	10	24 hours
Droperidol	Micrograms of droperidol per cubic metre of air	1	24 hours
Dustfall	Grams per square metre	7	30 days
Ethanol (Ethyl Alcohol)*	Micrograms of ethanol per cubic metre of air	19,000	1 hour
Ethyl Acetate*	Micrograms of ethyl acetate per cubic metre of air	19,000	1 hour
Ethyl Acrylate*	Micrograms of ethyl acrylate per cubic metre of air	4.5	1 hour
2-Ethyl Anthraquinone	Micrograms of 2-ethyl anthraquinone per cubic metre of air	10	24 hours
Ethyl Benzene*	Micrograms of ethyl benzene per cubic metre of air	4,000	1 hour
Ethyl Ether	Micrograms of ethyl ether per cubic metre of air	30,000	24 hours
Ethyl-3- * ethoxy Propionate	Micrograms of ethyl-3-ethoxy propionate per cubic metre of air	120	1 hour

2-Ethyl * Hexanol	Micrograms of 2-ethyl hexanol per cubic metre of air	600	1 hour
Ethylene	Micrograms of ethylene per cubic metre of air	40	24 hours
Ethylene-diamine-tetraacetic Acid	Micrograms of ethylene-diaminetetraacetic acid per cubic metre of air	35	24 hours
Ethylene Dichloride	Micrograms of ethylene dichloride per cubic metre of air	400	24 hours
Ethylene * Glycol Butyl Ether (Butyl Cellosolve)	Micrograms of ethylene glycol butyl ether per cubic metre of air	300	1 hour
Ethylene * Glycol Butyl Ether Acetate (Butyl Cellosolve Acetate)	Micrograms of ethylene glycol butyl ether acetate per cubic metre of air	425	1 hour
Ethylene Glycol Dinitrate	Micrograms of ethylene glycol dinitrate per cubic metre of air	3	24 hours
Ethylene * Glycol Ethyl Ether (Cellosolve)	Micrograms of ethylene glycol ethyl ether per cubic metre of air	665	1 hour
Ethylene * Gylcol Ethyl Ether Acetate (Cellosolve Acetate)	Micrograms of ethylene glycol ethyl ether acetate per cubic metre of air	180	1 hour
Ethylene Oxide	Micrograms of ethylene oxide per cubic metre of air	5	24 hours
Fentanyl Citrate	Micrograms of fentanyl citrate per cubic metre of air	0.02	24 hours

Ferric Oxide	Micrograms of ferric oxide per cubic metre of air	25	24 hours
Fluoridation (growing season)	Micrograms of total fluorides collected on 100 sq. centimetres of limed filter paper	40	30 days
Fluoridation (November 1 - March 31)	Micrograms of total fluorides collected on 100 sq. centimetres of limed filter paper	80	30 days
Fluorides (Gaseous) (April 15 to October 15)	Micrograms of gaseous, inorganic fluoride per cubic metre of air expressed as hydrogen fluoride	0.86 0.34	24 hours 30 days
Fluorides (Total) (April 15 to October 15)	Total micrograms of inorganic fluoride per cubic metre of air expressed as hydrogen fluoride	1.72 0.68	24 hours 30 days
Fluorides (Total) (October 16 April 14)	Total micrograms of inorganic fluoride per cubic metre of air expressed as hydrogen fluoride	3.44 1.38	24 hours 30 days
Fluorides in forage	Parts per million of fluorides dry weight	80	30 days
Fluorides in forage (average)	Parts per million of fluorides dry weight	60	2 months (consecutive)
Fluorides in forage (criterion, growing season average)	Parts per million of fluorides dry weight	35	30 days
Fluorinert 3M-FC-70	Micrograms of fluorinert 3M-FC-70 per cubic metre of air	35	24 hours
Formaldehyde*	Micrograms of formaldehyde per cubic metre of air	65	1 hour
Formic Acid	Micrograms of formic acid per cubic metre of air	500	24 hours
Furfural*	Micrograms of furfural per cubic meter of air	1,000	1 hour

Furfuryl Alcohol	Micrograms of furfuryl alcohol per cubic metre of air	1,000	24 hours
Glutaraldehyde	Micrograms of glutaraldehyde per cubic metre of air	14	24 hours
Haloperidol	Micrograms of haloperidol per cubic metre of air	0.1	24 hours
Hexachloro-cyclohexane (Lindane)	Micrograms of hexachloro-cyclohexane per cubic metre of air	5	24 hours
Hexachlorocyclo-pentadiene	Micrograms of hexachloro-cyclopentadiene per cubic metre of air	2	24 hours
Hexamethyl Disilazane	Micrograms of hexamethyl disilazane per cubic metre of air	2	24 hours
Hexamethylene Diisocyanate Monomer	Micrograms of hexamethylene diisocyanate monomer per cubic metre of air	0.5	24 hours
Hexamethylene Diisocyanate Trimer	Micrograms of hexamethylene diisocyanate trimer per cubic metre of air	1	24 hours
Hexane	Micrograms of hexane per cubic metre of air	12,000	24 hours
Hydrogen * Chloride	Micrograms of hydrogen chloride per cubic metre of air	40	24 hours
Hydrogen Cyanide	Micrograms of hydrogen cyanide per cubic metre of air	575	24 hours
Hydrogen Peroxide	Micrograms of hydrogen peroxide per cubic metre of air	30	24 hours
Hydrogen Sulphide	Micrograms of hydrogen sulphide per cubic metre of air	30	1 hour
Iron (metallic)	Micrograms of metallic iron per cubic metre of air	4	24 hours
Isobutanol	Micrograms of isobutanol per cubic metre of air	1,600	1 hour

Isobutyl * Acetate	Micrograms of isobutyl acetate per cubic metre of air	1,000	1 hour
Isopropanol (Isopropyl * Alcohol)	Micrograms of isopropanol per cubic metre of air	24,000	24 hours
Isopropyl * Acetate	Micrograms of isopropyl acetate per cubic metre of air	1,200	1 hour
Isopropyl * Benzene	Micrograms of isopropyl benzene per cubic metre of air	100	1 hour
Lead	Total micrograms of lead in free and combined form per cubic metre of air	5	24 hours
Lead	Total micrograms of lead in free and combined form per cubic metre of air (arithmetic mean)	3	30 days
Lead	Total micrograms of lead in free and combined form per cubic metre of air (geometric mean)	2	30 days
Lead in * Dustfall	Grams of lead in dustfall per square metre	0.1	30 days
Lithium (non-hydride)	Total micrograms of lithium in other than hydride compounds per cubic metre of air	20	24 hours
Lithium * Hydrides	Micrograms of lithium hydrides per cubic metre of air	2.5	24 hours
Magnesium Oxide	Total micrograms of magnesium oxide per cubic metre of air	100	24 hours
Malathion	Micrograms of malathion per cubic metre of air	35	24 hours
Maleic Anhydride	Micrograms of maleic anhydride per cubic metre of air	30	24 hours
Manganese Compounds	Total micrograms of manganese in free and combined form including potassium permanganate as manganese per cubic metre of air	10	24 hours

Mercaptans	Total micrograms of mercaptans per cubic metre of air expressed as methyl mercaptans	20	1 hour
Mercaptobenzo-thiazodisulphide	Micrograms of mercaptobenzo-thiazodisulphide per cubic metre of air	35	24 hours
Mercury	Total micrograms of mercury in free and combined form per cubic metre of air	2	24 hours
Mercury (alkyl)	Total micrograms of alkyl mercury compounds per cubic metre of air	0.5	24 hours
Metaldehyde	Micrograms of metaldehyde per cubic metre of air	35	24 hours
Methacrylic * Acid	Micrograms of methacrylic acid per cubic metre of air	2,000	24 hours
Methane Diphenyl Diisocyanate	Micrograms of methane diphenyl diisocyanate per cubic meter of air	1	24 hours
Methanol (Methyl Alchol)	Micrograms of methanol per cubic metre of air	28,000	24 hours
Methyl Acrylate	Micrograms of methyl acrylate per cubic metre of air	4	1 hour
Methyl Bromide	Micrograms of methyl bromide per cubic metre of air	1,350	24 hours
Methyl Chloride	Micrograms of methyl chloride per cubic metre of air	7,000	24 hours
Methyl Ethyl Ketone Peroxide	Micrograms of methyl ethyl ketone peroxide per cubic metre of air	80	24 hours
5-Methyl-2-hexanone	Micrograms of 5-methyl-2-hexanone per cubic metre of air	380	1 hour
Methyl Isobutyl Ketone	Micrograms of methyl isobutyl ketone per cubic metre of air	1,200	24 hours

Methyl Methacrylate *	Micrograms of methyl methacrylate per cubic metre of air	860	24 hours
Methyl Salicylate	Micrograms of methyl salicylate per cubic metre of air	100	24 hours
Methoxychlor	Micrograms of methoxychlor per cubic metre of air	35	24 hours
Methylene * Chloride	Micrograms of methylene chloride per cubic metre of air	100,000	1 hour
4,4-Methylene-bis-2-chloro-aniline	Micrograms of 4,4-methylene-bis-2-chloroaniline per cubic metre of air	10	24 hours
Methylene Dianiline	Micrograms of methylene dianiline per cubic metre of air	10	24 hours
Miconazole Nitrate	Micrograms of miconazole nitrate per cubic metre of air	5	24 hours
Milk Powder	Micrograms of milk powder per cubic metre of air	20	24 hours
Monomethyl * Amine	Micrograms of monomethyl amine per cubic metre of air	25	24 hours
Naphthalene*	Micrograms of naphthalene per cubic metre of air	30	1 hour
Nickel *	Total micrograms of nickel in free and combined form per cubic metre of air	2	24 hours
Nickel Carbonyl	Micrograms of nickel carbonyl per cubic metre of air	0.5	24 hours
Nitric Acid	Micrograms of nitric acid per cubic metre of air	35	24 hours
Nitrilotriacetic Acid	Micrograms of nitrilotriacetic acid per cubic metre of air	35	24 hours
Nitrogen Oxides	Micrograms of nitrogen oxides per cubic metre of air expressed as NO_2	200	24 hours

Nitroglycerin	Micrograms of nitroglycerin per cubic metre of air	3	24 hours
Nitrous Oxide	Micrograms of nitrous oxide per cubic metre of air	9,000	24 hours
Octane	Micrograms of octane per cubic metre of air	37,400	1 hour
1-Octene	Micrograms of 1-octene per cubic metre of air	50,000	24 hours
Oxalic Acid	Micrograms of oxalic acid per cubic metre of air	25	24 hours
Ozone	Micrograms of ozone per cubic metre of air	165	1 hour
Palladium (H_2O soluble)	Total micrograms of water soluble palladium compounds including palladium chloride as palladium	10	24 hours
Penicillin	Micrograms of penicillin per cubic metre of air	0.1	24 hours
Pentaborane	Micrograms of pentaborane per cubic metre of air	1	24 hours
Pentachlorophenol	Micrograms of pentachlorophenol per cubic metre of air	20	24 hours
Perchloroethylene	Micrograms of perchloroethylene per cubic metre of air	4,000	24 hours
Phenol*	Micrograms of phenol per cubic metre of air	100	24 hours
Phosgene	Micrograms of phosgene per cubic metre of air	45	24 hours
Phosphine	Micrograms of phosphine per cubic metre of air	10	24 hours
Phosphoric Acid	Micrograms of phosphoric acid per cubic metre of air expressed as P_2O_5	100	24 hours
Phosphorus Oxychloride	Micrograms of phosphorus oxychloride per cubic metre of air	12	24 hours

Phosphorus Pentachloride	Micrograms of phosphorus pentachloride per cubic metre of air	10	24 hours
Phthalic Anhydride	Micrograms of phthalic anhydride per cubic metre of air	100	24 hours
Pimozide	Micrograms of pimozide per cubic metre of air	1	24 hours
Platinum (H_2O soluble)	Total micrograms of platinum in water soluble compounds per cubic metre of air	0.2	24 hours
Polybutene-1-sulphone	Micrograms of polybutene-1-sulphone per cubic metre of air	35	24 hours
Polychlorinated Biphenyls (risk: 0.84/million)	Nanograms of polychlorinated biphenyls per cubic metre of air	150 35	24 hours 1 year
Polychloroprene	Micrograms of polychloroprene per cubic metre of air	35	24 hours
Potassium Cyanide (as total salt)	Micrograms of potassium cyanide as total salt per cubic metre of air	35	24 hours
Potassium Hydroxide	Micrograms of potassium hydroxide per cubic metre of air	14	24 hours
Potassium Nitrate	Micrograms of potassium nitrate per cubic metre of air	35	24 hours
N-Propanol (N-Propyl Alcohol)	Micrograms of n-propanol per cubic metre of air	16,000	24 hours
Propionaldehyde	Micrograms of propionaldehyde per cubic metre of air	2.5	24 hours
Propionic Acid	Micrograms of propionic acid per cubic metre of air	80	1 hour
Propionic Anhydride (expressed as propionic acid)	Micrograms of propionic anhydride as equivalent propionic acid per cubic metre of air	80	1 hour

Propylene Dichloride	Micrograms of propylene dichloride per cubic metre of air	2,400	24 hours
Propylene Glycol Methyl Ether	Micrograms of propylene glycol methyl ether per cubic metre of air	73,200	1 hour
Propylene * Glycol Monomethyl Ether Acetate	Micrograms of propylene glycol monomethyl ether acetate per cubic metre of air	4,100	1 hour
Propylene Oxide	Micrograms of propylene oxide per cubic metre of air	4,500	24 hours
Pyridine*	Micrograms of pyridine per cubic metre of air	48	1 hour
Selenium	Micrograms of selenium in free of combined form per cubic metre of air	10	24 hours
Silane	Micrograms of silane per cubic metre of air	150	24 hours
Silica-respirable (less than 10 micrometres in diameter)	Micrograms of respirable silica per cubic metre of air	5	24 hours
Silver	Total micrograms of silver in free and combined form per cubic metre of air	1	24 hours
Sodium Chlorite	Micrograms of sodium chlorite per cubic metre of air	20	24 hours
Sodium Cyanide (as total salt)	Micrograms of sodium cyanide as total salt per cubic metre of air	35	24 hours
Sodium Hydroxide	Micrograms of sodium hydroxide per cubic metre of air	10	24 hours
Solvesso * 100	Micrograms of solvesso 100 per cubic metre of air	1,030	1 hour

Solvesso * 150	Micrograms of solvesso 150 per cubic metre of air	1,030	1 hour
Stannous Chloride (as tin)	Micrograms of stannous chloride as tin per cubic metre of air	10	24 hours
Styrene*	Micrograms of styrene per cubic metre of air	400	24 hours
Subtilisin (Detergent Enzyme)	Micrograms of subtilisin per cubic metre of air	0.06	24 hours
Sulphation	Milligrams of sulphur trioxide per 100 square centimetres of exposed lead peroxide	0.7	30 days
Sulphur Dioxide	Micrograms of sulphur dioxide per cubic metre of air	275 690 55	24 hours 1 hour 1 year (arithmetic mean)
Sulphuric Acid	Micrograms of sulphuric acid per cubic metre of air	35	24 hours
Suspended Particulate Matter (particulate less than 44 microns in size)	Total micrograms of suspended particulate matter per cubic metre of air	120 60	24 hours 1 year (geometric mean)
Talc (fibrous)	Micrograms of fibrous talc per cubic metre of air	2	24 hours
Tellurium (except hydrogen telluride)	Micrograms of tellurium in free and combined form per cubic metre of air	10	24 hours
Tetrabutylurea	Micrograms of tetrabutylurea per cubic metre of air	10	24 hours
Tetrahydrofuran*	Micrograms of tetrahydrofuran per cubic metre of air	93,000	24 hours
Tetramethyl thiuram disulphide	Micrograms of tetramethyl thiuram disulphide per cubic metre of air	10	24 hours

Thiourea	Micrograms of thiourea per cubic metre of air	20	24 hours
Tin	Total micrograms of tin in free and combined form per cubic metre of air	10	24 hours
Titanium	Micrograms of titanium per cubic metre of air	35	24 hours
Tolmetin Sodium	Micrograms of tolmetin sodium per cubic metre of air	5	24 hours
Toluene*	Micrograms of toluene per cubic metre of air	2,000	24 hours
Toluene Diisocyanate	Micrograms of toluene di-isocyanate per cubic metre of air	0.5	24 hours
Total Reduced Sulphur (TRS) as equivalent H_2S (from Kraft Pulp Mills)	Micrograms of total reduced sulphur as equivalent H_2S per cubic metre of air	40	1 hour
1,2,4-Trichloro-benzene	Micrograms of 1,2,4-trichlorobenzene per cubic metre of air	35	24 hours
1,1,1-Trichloro-ethane (Methyl Chloroform)	Micrograms of 1,1,1-trichloroethane per cubic metre of air	115,000	24 hours
Trichloro-ethylene	Micrograms of trichloro-ethylene per cubic metre of air	28,000	24 hours
Triflouro-trichloro-ethane	Micrograms of triflouro-trichloroethane per cubic metre of air	800,000	24 hours
Trimethyl * Amine	Micrograms of trimethyl amine per cubic metre of air	0.5	1 hour
1,2,4-Trimethyl Benzene	Micrograms of 1,2,4-trimethyl benzene per cubic metre of air	35	24 hours

Tripropyltin Methacrylate	Micrograms of tripropyltin methacrylate per cubic metre of air	1	24 hours
Vanadium	Total micrograms of vanadium in free and combined form per cubic metre of air	2	24 hours
Vinyl Chloride	Micrograms of vinyl chloride per cubic metre of air	280	24 hours
Warfarin	Micrograms of warfarin per cubic metres of air	10	24 hours
Whey Powder	Micrograms of whey powder per cubic metre of air	35	24 hours
Xylenes*	Total micrograms of xylene isomers per cubic metre of air	2,300	24 hours
Zinc	Total micrograms of zinc in free and combined form per cubic metre of air	100	24 hours